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| 10/087,130 | 02/28/2002 | Nikki M. Bruner | P1569US01 | 4401 |

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1) ☒ Responsive to communication(s) filed on <u>21 October 2005</u>.

2a) ☐ This action is **FINAL**.     2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4) ☒ Claim(s) <u>1-13,15-26 and 28-30</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) <u>1-13,15-26 and 28-30</u> is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on <u>16 November 2004</u> is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some * c) ☐ None of:

      1. ☐ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____.

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Arguments*

1.     Applicant's arguments with respect to claims 15-26 have been considered but are

moot in view of the new ground(s) of rejection.

### *Claim Objections*

2.     Claims 29 to 30 are objected to because of the following informalities:  claims 29

and 30 are written as a preamble with no body (proper indentation is required).

Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly
> claiming the subject matter which the applicant regards as his invention.

3.     Claims 29 and 30 are rejected under 35 U.S.C. 112, second paragraph, as failing

to set forth the subject matter which applicant(s) regard as their invention.

Claims 29 and 30 are written as a preamble with no body (proper indentation is

required).  Note: preambles are not normally give patentable weight.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1.  Determining the scope and contents of the prior art.
2.  Ascertaining the differences between the prior art and the claims at issue.
3.  Resolving the level of ordinary skill in the pertinent art.
4.  Considering objective evidence present in the application indicating obviousness or nonobviousness.

4.      Claims 1, 4, 5, 9-11, 15, 21, 24-26 and 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over McNeil; Michael et al. (US 5995305 A, hereafter referred to as McNeil) in view of Makansi; Tarek et al. (US 4804959 A, hereafter referred to as Makansi).

35 U.S.C. 103(a) rejection of claims 1 and 28.

McNeil teaches a digital data channel which stores input data to a data storage medium and subsequently retrieves output data from the medium made from the input data (Figure 6 in McNeil is a digital data channel which stores input data to a data storage medium and subsequently retrieves output data from the medium made from the input data; Note: The Authoritative Dictionary of IEEE Standards Terms defines channel as a path along which signals can be sent; hence a storage medium along with its read, write and recovery circuitry is a channel); and a circuit connected to the digital data channel which can predict error rate performance in relation to a digital configuration for both the

input data and output data (col. 12, lines 65-67 in McNeil teaches a run length limited

code digital configuration and col. 14, lines 18-32 in McNeil teaches that Soft Error Rate

Comparator Circuit 108 in Figure 6 for predicting error rate performance in relation to

the RRL digital encoded configuration for both the input data and output data for

adaptively controlling storage and retrieval of data from the digital storage medium).

However McNeil does not explicitly teach the specific use of characterizing the input

and output data in at least two alternative digital configurations.

Makansi, in an analogous art, teaches use of characterizing the input and output data in

at least two alternative digital configurations (the Abstract and Figure 1 of Makansi

teaches separate encoders and decoders for characterizing the input and output data in

at least two alternative run length limited RLL digital code configurations).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to modify McNeil with the teachings of Makansi by including use of

characterizing the input and output data in at least two alternative digital configurations.

This modification would have been obvious to one of ordinary skill in the art, at the time

the invention was made, because one of ordinary skill in the art would have recognized

that use of characterizing the input and output data in at least two alternative digital

configurations would have increased disk storage capacity by exploiting track length

differences between outer tracks and inner tracks (col. 2, lines 14-21 in Makansi).

35 U.S.C. 103(a) rejection of claim 4.

Col. 12, lines 65-67 in McNeil teaches a run length limited code digital configuration and

col. 14, lines 18-32 in McNeil teaches that Soft Error Rate Comparator Circuit for

predicting error rate performance in relation to the **single** RRL digital encoded

configuration for both the input data and output data for adaptively controlling storage

and retrieval of data from the digital storage medium.

35 U.S.C. 103(a) rejection of claim 5.

Makansi teaches the circuit performs run length limited (RLL) encoding upon the input

data prior to characterizing the input data (Encoders 7a-7c in Figure 1 of Makansi

perform RLL encoding prior to the Encoder Seelct circuit 8 characterizing encoding

requirements for input data), and wherein the circuit further inhibits RLL decoding of the

output data to reflect said RLL encoding (Decoder Select 10 in Figure 1 of Makansi

substantially inhibits non-selected RLL decoders from being used in future processes to

reflect said RLL encoding).

35 U.S.C. 103(a) rejection of claim 9.

Col. 14, lines 18-32 in McNeil teaches that Soft Error Rate Comparator Circuit 108 in

Figure 6 for predicting error rate performance by comparing the input sequence and the

output sequence.

35 U.S.C. 103(a) rejection of claims 10 and 11.

The Abstract and Figure 1 of Makansi teaches separate encoders and decoders for characterizing the input and output data in at least two alternative run length limited RLL digital code configurations.

35 U.S.C. 103(a) rejection of claims 15, 29 and 30.

McNeil teaches using a digital data channel to store input data to a data storage medium (Figure 6 in McNeil is a digital data channel which stores input data to a data storage medium and subsequently retrieves output data from the medium made from the input data; Note: The Authoritative Dictionary of IEEE Standards Terms defines channel as a path along which signals can be sent; hence a storage medium along with its read, write and recovery circuitry is a channel); subsequently using the digital data channel to obtain output data from the medium (data previously written to the disk storage in Figure 6 of McNeil is read); arranging the input data into a digital configuration (col. 12, lines 65-67 in McNeil teaches a run length limited code digital configuration); arranging the output data into the selected digital configuration (data read from the disk in Figure 6 of McNeil is arranged into the selected digital configuration); and comparing the output data arranged the selected digital configuration with the input data arranged in the selected digital configuration to determine an error rate performance (col. 14, lines 18-32 in McNeil teaches that Soft Error Rate Comparator Circuit 108 in Figure 6 for predicting error rate performance in relation to the RRL digital encoded configuration by comparing the input data and output

data for adaptively controlling storage and retrieval of data from the digital storage

medium).

However McNeil does not explicitly teach the specific use of arranging the input data

into a **selected** digital **configuration from a plurality of different selectable digital**

**configurations**.

Makansi, in an analogous art, teaches use of characterizing the input and output data in

at least two alternative digital configurations (the Abstract and Figure 1 of Makansi

teaches separate encoders and decoders for characterizing the input and output data in

at least two alternative run length limited RLL digital code configurations).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to modify McNeil with the teachings of Makansi by including use of

characterizing the input and output data in at least two alternative digital configurations.

This modification would have been obvious to one of ordinary skill in the art, at the time

the invention was made, because one of ordinary skill in the art would have recognized

that use of characterizing the input and output data in at least two alternative digital

configurations would have increased disk storage capacity by exploiting track length

differences between outer tracks and inner tracks (col. 2, lines 14-21 in Makansi).


35 U.S.C. 103(a) rejection of claim 21.

Makansi teaches the circuit performs run length limited (RLL) encoding upon the input

data prior to characterizing the input data (Encoders 7a-7c in Figure 1 of Makansi

perform RLL encoding prior to the Encoder Seelct circuit 8 characterizing encoding

requirements for input data), and wherein the circuit further inhibits RLL decoding of the output data to reflect said RLL encoding (Decoder Select 10 in Figure 1 of Makansi substantially inhibits non-selected RLL decoders from being used in future processes to reflect said RLL encoding).

35 U.S.C. 103(a) rejection of claim 24.

Col. 12, lines 65-67 in McNeil teaches a run length limited code digital configuration and col. 14, lines 18-32 in McNeil teaches that Soft Error Rate Comparator Circuit for predicting error rate performance in relation to the **single** RRL digital encoded configuration for both the input data and output data for adaptively controlling storage and retrieval of data from the digital storage medium.

35 U.S.C. 103(a) rejection of claim 25.

The Abstract and Figure 1 of Makansi teaches separate encoders and decoders for characterizing the input and output data in at least two alternative run length limited RLL digital code configurations.

35 U.S.C. 103(a) rejection of claim 26.

Col. 14, lines 18-32 in McNeil teaches that Soft Error Rate Comparator Circuit 108 in Figure 6 for predicting error rate performance by comparing the input sequence and the output sequence.

5.    Claims 2, 3, 12, 18 and 19 are rejected under 35 U.S.C. 103(a) as being

unpatentable over McNeil; Michael et al. (US 5995305 A, hereafter referred to as

McNeil) and Makansi; Tarek et al. (US 4804959 A, hereafter referred to as Makansi) in

view of Franaszek, Peter A. (US 3689899 A).

35 U.S.C. 103(a) rejection of claims 2 and 18.

McNeil and Makansi substantially teaches the claimed invention described in claims 1

and 15 (as rejected above).

However McNeil and Makansi do not explicitly teach the specific use of multi-bit

symbols.

Franaszek, in an analogous art, teaches use of multi-bit symbols (see Abstract in

Franaszek; Note: an RLL codeword is a multi-bit symbol).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to modify McNeil and Makansi with the teachings of Franaszek by

including use of multi-bit symbols.  This modification would have been obvious to one of

ordinary skill in the art, at the time the invention was made, because one of ordinary skill

in the art would have recognized that use of multi-bit symbols would have provided a

desired coding efficiency achieved without unduly complicating the design of the

encoding and decoding apparatus if the encoded information is handled in the form of

variable-length symbol words rather than fixed-length symbol words (see col. 1, lines

31-37 in Franaszek).

35 U.S.C. 103(a) rejection of claims 3 and 19.

The Abstract in Franaszek teaches variable length multibit codeword symbols.


35 U.S.C. 103(a) rejection of claim 12.

Figure 1B in Franaszek teaches a shift register for arranging variable length codeword

symbols.  Shift register components are state machines.


6.      Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over McNeil;

Michael et al. (US 5995305 A, hereafter referred to as McNeil) and Makansi; Tarek et al.

(US 4804959 A, hereafter referred to as Makansi) in view of Turk; Stephen A. et al. (US

6505320 B1, hereafter referred to as Turk).


35 U.S.C. 103(a) rejection of claim 6.

McNeil and Makansi substantially teaches the claimed invention described in claims 1

and 15 (as rejected above).

However McNeil and Makansi do not explicitly teach the specific use of a ECC encoding

and decoding.

Turk, in an analogous art, teaches use of a ECC encoding and decoding (see Figure 4

in Turk).  Note: comparing input data with output data detects all errors in the data

including correctable as well as non-correctable errors.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to modify McNeil and Makansi with the teachings of Turk by

including use of a ECC encoding and decoding. This modification would have been
obvious to one of ordinary skill in the art, at the time the invention was made, because
one of ordinary skill in the art would have recognized that use of a ECC encoding and
decoding would have provided improved data integrity.

7.      Claims 7 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over
McNeil; Michael et al. (US 5995305 A, hereafter referred to as McNeil) and Makansi;
Tarek et al. (US 4804959 A, hereafter referred to as Makansi) in view of Reed; David E.
et al. (US 6115198 A, hereafter referred to as Reed).

35 U.S.C. 103(a) rejection of claims 7 and 22.

McNeil and Makansi substantially teaches the claimed invention described in claim 1
and 15 (as rejected above).

However McNeil and Makansi does not explicitly teach the specific use of interleaving.

Reed, in an analogous art, teaches use of interleaving (see Interleaver 100 in Figure 9A
of Schachner).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the
invention was made to modify McNeil and Makansi with the teachings of Reed by
including use of interleaving. This modification would have been obvious to one of
ordinary skill in the art, at the time the invention was made, because one of ordinary skill
in the art would have recognized that use of interleaving would have provided the
opportunity to effectively decode RLL encoded data.

8.      Claims 8 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over

McNeil; Michael et al. (US 5995305 A, hereafter referred to as McNeil) and Makansi;

Tarek et al. (US 4804959 A, hereafter referred to as Makansi) in view of Schachner;

Joseph M. et al. (US 6442730 B1, hereafter referred to as Schachner).


35 U.S.C. 103(a) rejection of claims 8 and 23.

McNeil and Makansi substantially teaches the claimed invention described in claim 1

and 15 (as rejected above).  In addition, Makansi teaches the circuit performs run length

limited (RLL) encoding upon the input data prior to characterizing the input data

(Encoders 7a-7c in Figure 1 of Makansi perform RLL encoding prior to the Encoder

Seelct circuit 8 characterizing encoding requirements for input data), and wherein the

circuit further inhibits RLL decoding of the output data to reflect said RLL encoding

(Decoder Select 10 in Figure 1 of Makansi substantially inhibits non-selected RLL

decoders from being used in future processes to reflect said RLL encoding).

However McNeil and Makansi do not explicitly teach the specific use of emulation.

Schachner, in an analogous art, teaches use of emulation (see Abstract in Schachner).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to modify McNeil and Makansi with the teachings of Schachner by

including use of emulation.  This modification would have been obvious to one of

ordinary skill in the art, at the time the invention was made, because one of ordinary skill

in the art would have recognized that use of emulation would have provided more

accurately determine if errors exist in the signal  (col. 4, lines 56-62 in Schachner).

9.      Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over McNeil;

Michael et al. (US 5995305 A, hereafter referred to as McNeil), Makansi; Tarek et al.

(US 4804959 A, hereafter referred to as Makansi) and Franaszek, Peter A. (US

3689899 A) in view of Lee; Patrick J. (US 6405342 B1).

35 U.S.C. 103(a) rejection of claim 13.

McNeil, Makansi and Franaszek substantially teaches the claimed invention described

in claims 1, 2 and 12 (as rejected above).

However McNeil, Makansi and Franaszek do not explicitly teach the specific use of

determining an uncorrectable number of erroneous symbols in each interleave that

exceed a correctable number of erroneous symbols that can be detected by a first ECC

encoding methodology.

Lee, in an analogous art, teaches use of determining an uncorrectable number of

erroneous symbols in each interleave that exceed a correctable number of erroneous

symbols that can be detected by a first ECC encoding methodology (col. 9, lines 6-10,

Lee).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to modify McNeil, Makansi and Franaszek with the teachings of

Lee by including use of determining an uncorrectable number of erroneous symbols in

each interleave that exceed a correctable number of erroneous symbols that can be

detected by a first ECC encoding methodology. This modification would have been

obvious to one of ordinary skill in the art, at the time the invention was made, because

one of ordinary skill in the art would have recognized that use of determining an

uncorrectable number of erroneous symbols in each interleave that exceed a

correctable number of erroneous symbols that can be detected by a first ECC encoding

methodology would have provided an indicator for retry operations based on

uncorrectable error level (col. 9, lines 6-28, Lee).


10.     Claim 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over

McNeil; Michael et al. (US 5995305 A, hereafter referred to as McNeil) and Makansi;

Tarek et al. (US 4804959 A, hereafter referred to as Makansi) in view of Shikakura;

Akihiro (US 5687182 A).


35 U.S.C. 102(b) rejection of claim 16.

McNeil and Makansi substantially teaches the claimed invention described in claims 15

and 15 (as rejected above).

However McNeil and Makansi do not explicitly teach the specific use of a ECC encoding

and decoding.

Shikakura, in an analogous art, teaches use of a ECC encoding and decoding (see

Figure 1 in Shikakura). Note: comparing input data with output data detects all errors in

the data including correctable as well as non-correctable errors.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to modify McNeil and Makansi with the teachings of Shikakura by

including use of a ECC encoding and decoding. This modification would have been

obvious to one of ordinary skill in the art, at the time the invention was made, because

one of ordinary skill in the art would have recognized that use of a ECC encoding and

decoding would have provided improved data integrity.


35 U.S.C. 102(b) rejection of claim 17.

Col. 3, lines 11-29 in Shikakura teaches that syndromes are generated and used to

count the number of errors within a predetermined time duration; Note: error rate is

defined as the number of errors within a predetermined time duration; Note also: that a

syndrome for an error correction code is 0, if the output data is equal to the original

input data after encoding and prior to being passed through the storage medium, and is

non-zero, if the output data is not equal to the input data; hence a syndrome is

substantially a comparison result indicating that the output data matches the input data

when the syndrome is zero and indicating that the output data does not match the input

data when the syndrome is not zero. Note: syndromes are used to generate error

locations and magnitudes for the number of errors found.

Note: comparing input data with output data detects all errors in the data including

correctable as well as non-correctable errors.

11.     Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over McNeil;

Michael et al. (US 5995305 A, hereafter referred to as McNeil) and Makansi; Tarek et al.

(US 4804959 A, hereafter referred to as Makansi) in view of Franaszek, Peter A. (US

3689899 A) in view of Blaum; Miguel M. et al. (US 5068858 A, hereafter referred to as

Blaum).

35 U.S.C. 103(a) rejection of claim 20.

McNeil, Makansi and Franaszek substantially teaches the claimed invention described

in claims 15, 18 and 19 (as rejected above).

However McNeil, Makansi and Franaszek do not explicitly teach the specific use of

using a second error correction code (ECC) encoding methodology.

Blaum, in an analogous art, teaches use of using a second error correction code (ECC)

encoding methodology (see Abstract in Blaum, Note; an ECC code with a reduced

number of redundant bits is a second error correction code).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to modify McNeil, Makansi and Franaszek with the teachings of

Blaum by including use of using a second error correction code (ECC) encoding

methodology.  This modification would have been obvious to one of ordinary skill in the

art, at the time the invention was made, because one of ordinary skill in the art would

have recognized that use of using a second error correction code (ECC) encoding

methodology would have provided increased correction capability periodically when

capability decreases (see Abstract in Blaum).

### *Conclusion*

12.    Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph D. Torres whose telephone number is (571) 272-3829.  The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert Decady can be reached on (571) 272-3819.  The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system.  Status information for published applications may be obtained from either Private PAIR or Public PAIR.  Status information for unpublished applications is available through Private PAIR only.  For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).
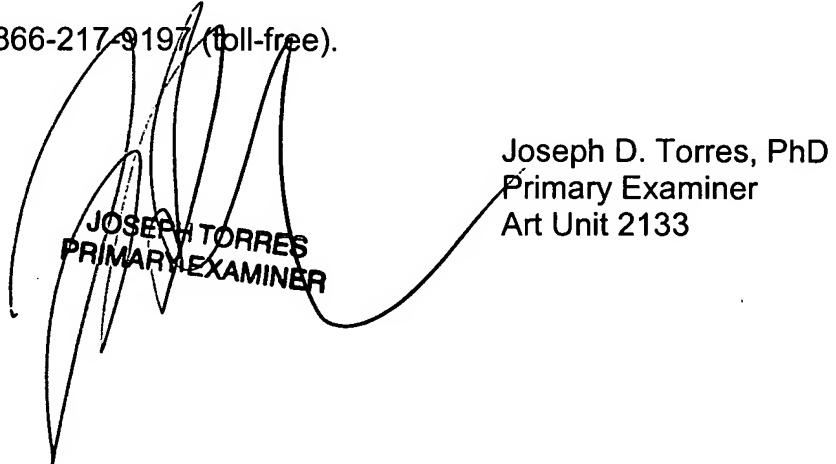
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